

DESCRIPTION OF A NEW *AXIANASSA*
(CRUSTACEA: DECAPODA: THALASSINIDEA)
FROM BRAZIL, AND ITS FIRST LARVAL STAGE

Sérgio de A. Rodrigues and Roberto Munehisa Shimizu

Abstract.—A new species of laomediid mud shrimp, *Axianassa australis* is described from the Brazilian coast. The species is characterized by possessing a long dagger-like antennal acicle with a tooth on the mesial margin, a small tooth on the basis of maxilliped 3 and a spiniform process on abdominal somite 1. The larva has a smooth carapace, abdominal segment 5 with a pair of lateral spines, mandibles asymmetrical and sickle-shaped, endopod of maxillule and maxilla unsegmented, maxillipeds with exopods 2 segmented, maxilliped 3 without endopod, telson spatuliform and with spine 2 reduced.

Schmitt (1924) established the genus *Axianassa* for *A. intermedia* based on specimens from Curaçao, Lesser Antilles, and later (Schmitt 1936) registered the presence of the same species at Aruba. In the interim Boone (1931) described a second species, *A. mineri*, from the Pacific coast of Panama. Due to the cryptic way of life of these fossorial crustaceans no other records of *Axianassa* appeared in the literature until the recent descriptions by Kensley & Heard (1990) of *A. arenaria*, *A. canalis* and *A. jamaicensis* from the Gulf of Mexico, the Panama Canal and Jamaica, respectively. These authors also reexamined all the nine specimens deposited in North American collections and redescribed *A. intermedia* and *A. mineri*.

A new species is here described from the coast of Brazil, based on material collected at Valença, Estado da Bahia, and São Sebastião, Estado de São Paulo (Rodrigues & Shimizu 1987). Several specimens were obtained alive from the latter locality with the help of a suction device (Rodrigues 1966) similar to the “yabby pump” developed in Australia (Hailstone & Stephenson 1961). One ovigerous female was maintained in an aquarium inside an artificial burrow (Rodrigues 1983, Rodrigues & Hödl 1990) until

the hatching of the larvae. The larvae hatched as pre-zoea and in a few hours shed the embryonic skin to become a free swimming zoea. These larvae were placed in Petri dishes with water from the collection site and fed *Artemia* nauplii. Only one larva reached the second stage, dying soon thereafter. As the larvae of *Axianassa* species hatched from eggs have not been previously described, a description of the first larval stage of *A. australis*, new species is here included to provide more information for the controversial question of thalassinidean phylogeny (Saint Laurent 1973, 1979; Poore & Griffin 1979, Kensley & Heard 1990).

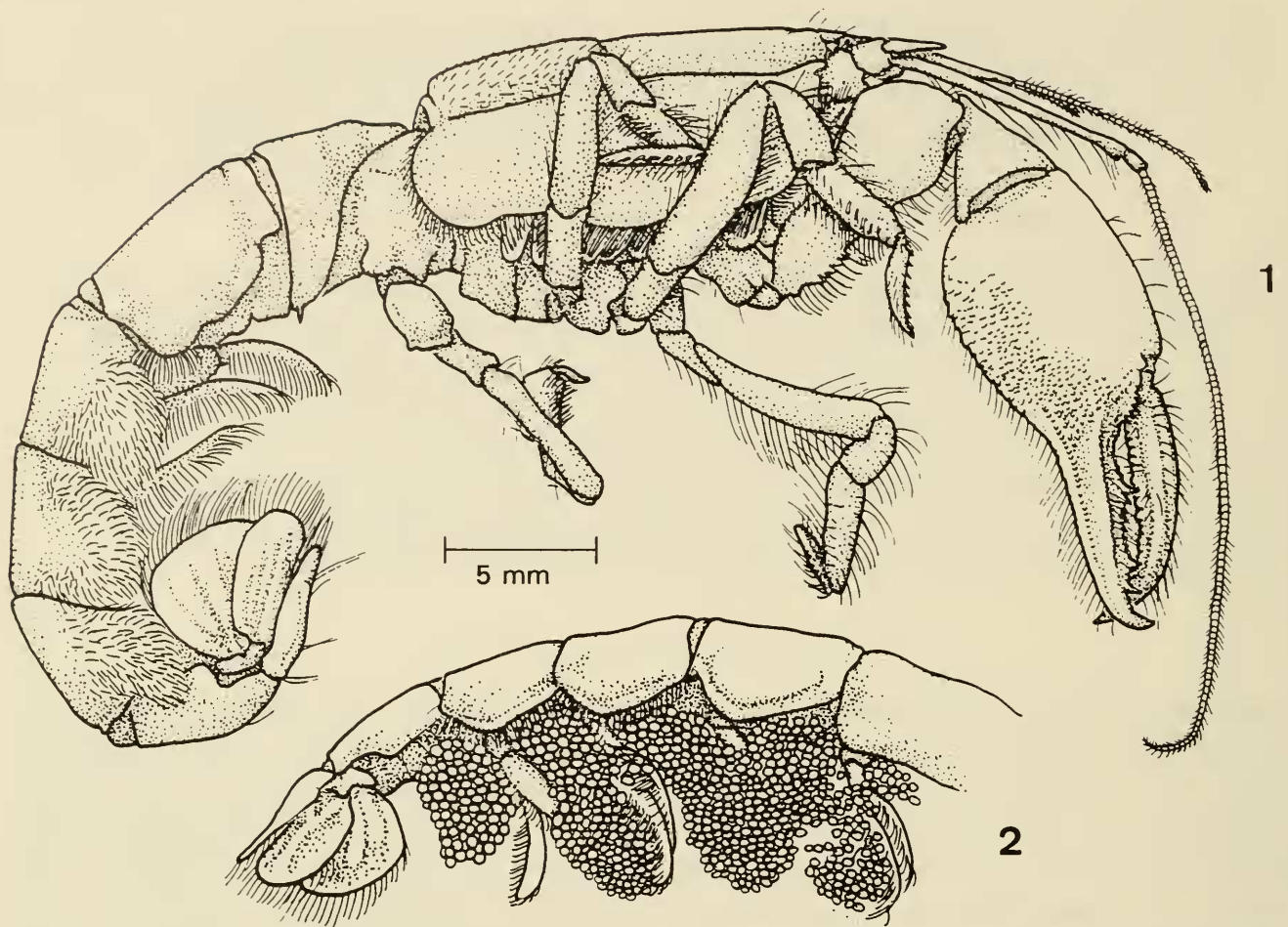
The holotype has been deposited in the Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil (MZUSP) and paratypes are in the collections of the National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A. (USNM) and the Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands (RMNH).

Family Laomediidae

Axianassa australis, new species

Figs. 1–20

Material.—Holotype, MZUSP 105841, 1 ♂ cl 13.4 mm; USNM, 1 ♂ cl 14.2 mm, Fa-



Figs. 1, 2. *Axianassa australis*, new species, paratypes: 1, ♂, in lateral view; 2, ♀, abdomen with eggs in lateral view.

zenda Maricultura, Valença, Bahia, Brazil, intertidal, taken from mangrove mud during the digging of a shrimp pond, coll. S.L.S. Bueno, Mar 1983. USNM 243485, 1 ♂ cl 7 mm, 1 ♀ cl 6.1 mm; RMNH 37697, 1 ♀, not measured; RMNH 37698, 1 ♂, not measured; Praia do Araçá, São Sebastião, São Paulo, Brazil, intertidal, taken from burrow in muddy sand with yabby pump, coll. S. A. Rodrigues and R. M. Shimizu, May 1985.

Description.—Carapace with linea thalassinica and cervical groove clearly defined; rostrum anteriorly rounded, reaching beyond cornea of eyes (Figs. 1, 3). Abdomen thin-walled, tergites bearing minute spiniform hairs; somite 1 somewhat longer than somite 2 and about as long as somites 3–6, pleuron produced ventrally into small but strong spiniform process; somite 2 with pos-

tero-lateral margins bearing dense tuft of plumose setae; somites 3–5 with very dense lateral fringes of plumose setae; somite 6 almost naked, ventral margins sinuous (Figs. 1, 2). Telson length slightly less than greatest width; broadly rounded posteriorly, bearing long plumose setae (Figs. 1, 2, 20).

Cornea not clearly demarcated from eye-stalk, moderately pigmented. Article 3 of antennular peduncle slender, elongate-cylindrical, about twice combined length of articles 1 and 2; ventral flagellum slightly more than $\frac{1}{3}$ length of dorsal flagellum; latter reaching slightly beyond tip of antennal peduncle (Fig. 3). Antennal acicle slender, dagger-like, with small sharp tooth on mesial margin; peduncle article 4 slender, elongate-cylindrical, bearing long and short scattered setae along its length; flagellum

reaching beyond tip of chelipeds (Figs. 1, 3).

Mouthparts as illustrated. Mandible (Fig. 4) with 8 cusps on cutting edge; palp 3-segmented; articles 2 and 3 each bearing 5 plumose setae. Maxilla 2 (Fig. 6), scaphognathite bearing 7 elongate setae on posterior margin. Maxilliped 1 (Fig. 7), endopod and proximal part of exopod paddle-shaped; exopod 3-segmented. Maxilliped 2 (Fig. 8) typical of genus. Maxilliped 3 (Fig. 9), basis with 1 or 2 (in large specimens) small teeth on lateral surface; dentate crest of ischium bearing 14 teeth; merus, carpus and propodus with bands of fusiform setae.

Pereopods 1 (Figs. 10–13) asymmetrical, sexually dimorphic. Males (Figs. 12, 13) with ventral margin of ischium bearing 3–6 sharp teeth; ventral margin of merus obscurely denticulated; carpus of larger chela with vestigial tubercle ventrodistally; dactylus of larger chela shorter than palm, both fingers with inconspicuous and rounded teeth; dactylus of smaller chela longer than palm, cutting edge bearing row of small rounded teeth; fixed finger with many small and 3 large canine-like teeth. Females (Figs. 10, 11) with ventral margin of ischium bearing 3 sharp teeth; merus and carpus smooth; larger chela with dactylus about as long as palm, fixed finger with many small and 2 large canine-like teeth.

Pereopod 2 (Fig. 14), merus, carpus and propodus bearing elongate setae on posterior margins; dactylus armed with row of fine spinules on posterior margin. Pereopod 3 (Fig. 15) and 4 (Fig. 16) similar; propodus with posterodistal band of stiff setae; dactylus sickle-shaped with row of 9–14 strong corneous spines on posterior margin, anterior margin bearing row of fine spinules. Pereopod 5 (Fig. 17) sub-chelate, propodus with long grooming apparatus on inner face; dactylus flattened, with row of tiny spinules along posterior margin.

Pleopod 1 of males absent; of females (Fig. 18) slender, 2-segmented, terminal segment

with crenulated margins. Pleopods 2–5 (Fig. 19) similar, endopod and exopod oval-shaped.

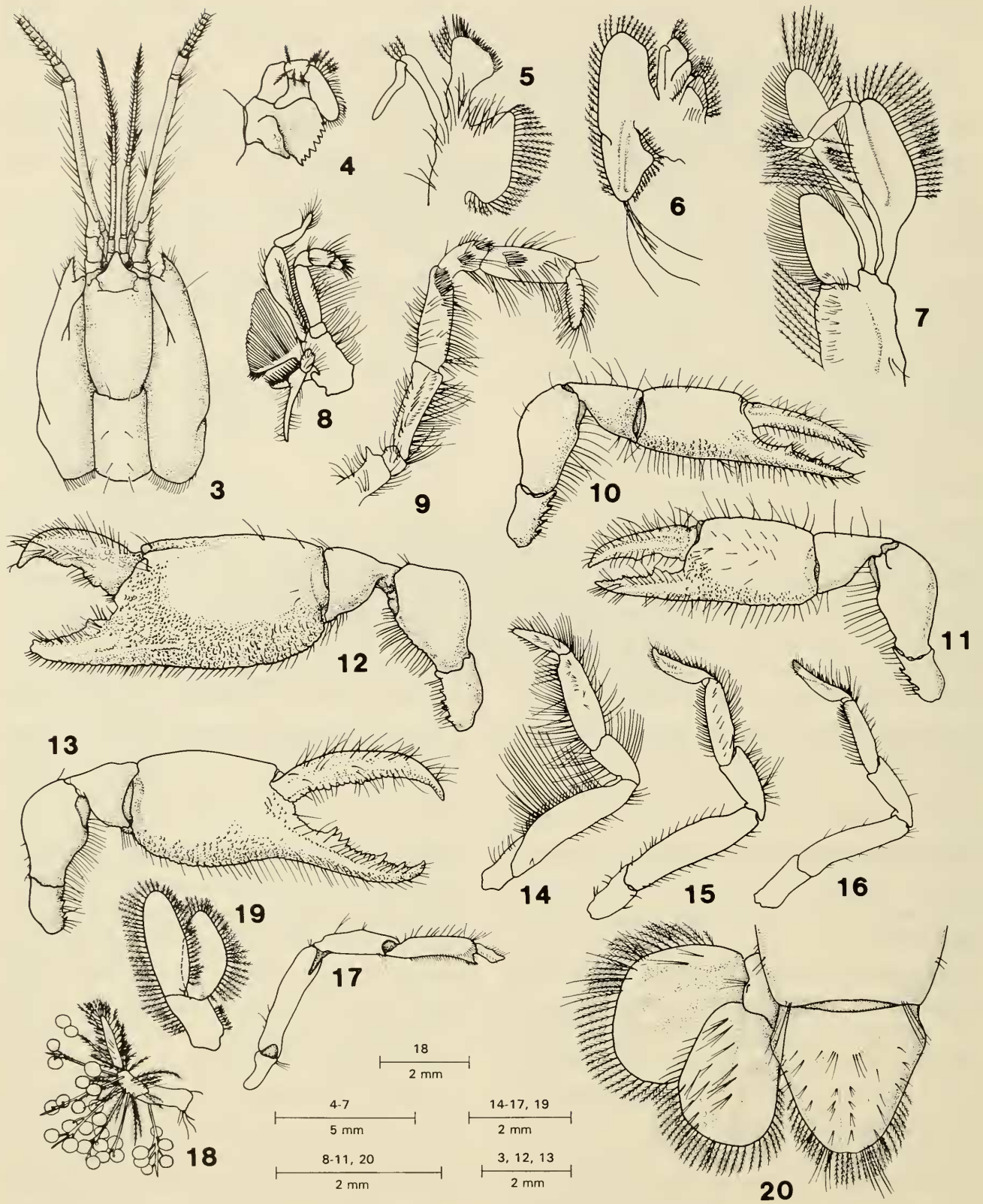
Uropodal rami broadly ovate, margins without spines, dorsal surfaces with scattered minute spinules, visible only under high magnification.

Gill formula as in type species of genus (Kensley & Heard 1990).

Coloration.—Both sexes have a salmon-pinkish body and pale yellowish pereopods and antennae.

Etymology.—The specific name refers to the South, as this is the first species of the genus to be reported from the Southern Hemisphere.

Discussion.—*Axianassa australis* is closely related to *A. canalis* considering the long, dagger-like shaped antennal acicle (short and apically bifid in *A. mineri*) with a tooth on the mesial margin (lacking in *A. arenaria*), and the spiniform process of abdominal somite 1 (absent in *A. jamaicense* and *A. intermedia*). However, *A. australis* differs from *A. canalis* in the following characters: in *A. canalis* the article 4 of antennal peduncle bears a row of short spinules along the ventral surface and in *A. australis* long and short scattered setae; in *A. canalis* the maxilliped 3 has a strong tooth on the basis and a band of fusiform setae on the posterior margin of the ischium, while in *A. australis* this appendage bears 1 or 2 (in the larger specimens) small teeth on the basis and no band of fusiform setae on the ischium; examination of the type specimen of *A. canalis* revealed the presence of two small posterolateral corneous spinules on the coxae of pleopods 2–4 that were not mentioned in the original description, these spinules being absent in *A. australis*; the single marginal tooth on the lateral margin of the outer uropodal ramus of *A. canalis* is not found in *A. australis*; the minute spinules scattered over the surface of the abdominal tergites of *A. australis* are absent in *A. canalis*. As the first pereopods of *A. canalis* are missing



Figs. 3-20. *Axianassa australis*, new species. 3-9, 12-17, 19, 20, holotype; 10, 11, 18, paratype. 3, carapace in dorsal view; 4, mandible; 5, maxilla 1; 6, maxilla 2; 7, maxilliped 1; 8, maxilliped 2; 9, maxilliped 3, inner view; 10, pereopod 1, smaller cheliped of female; 11, pereopod 1, larger cheliped of female; 12, pereopod 1, larger cheliped of male; 13, pereopod 1, smaller cheliped of male; 14, pereopod 2; 15, pereopod 3; 16, pereopod 4; 17, pereopod 5; 18, pleopod 1 of female with eggs; 19, pleopod 2-5; 20, telson and left uropod in dorsal view.

in the only existing specimen, other differences may also be found, as these legs are usually species-specific in proportions and armature.

Habitat. — In both collecting sites, *A. australis* was found in poorly oxygenated muddy sediment of very sheltered areas near mangrove vegetation. At São Sebastião the population is small, restricted to an area of about 100 × 50 m and is situated nearly 300 m from the type locality of *Callichirus guassutunga* (Rodrigues, 1971) and *C. guara* (Rodrigues, 1971). For further information see the remarks on the habitat of *C. guassutunga* in Rodrigues (1971).

First Larval Stage Figs. 21–32

Total length around 3 mm. Body laterally compressed, transparent except for orange chromatophore on middle anterior portion of carapace and dark pigment of eyes.

Carapace (Figs. 21, 22) smooth; without teeth, serrations, linea thalassinica or cervical groove; rostrum smooth and straight, about as long as antennae.

Abdomen (Figs. 21, 22) 5-segmented, somite 5 bearing pair of large lateral spines, somite 6 fused with telson.

Eyes (Figs. 21, 22) rounded, sessile.

Antennule (Fig. 23) unsegmented; distal extremity with 3 aesthetascs and 2 smooth setae. Antenna (Fig. 24), exopod with 1 spine and 10 setae, endopod with 3 apical setae, protopod without spine.

Mandibles (Figs. 25, 26) asymmetrical, sickle-shaped, left much more slender than right. Maxillule (Fig. 27), endopod unsegmented with 3 apical setae, protopodal endites each with 4 setae. Maxilla (Fig. 28), scaphognathite with 5 setae; endopod small, unsegmented, with 2 setae; protopodal endites each with 4 setae.

Maxilliped 1 (Fig. 29), exopod 2-segmented, with 4 apical setae; endopod with 4 segments, bearing 4, 1, 0, 1 setae from distal

to proximal; protopod with 3 setae on mesial margin and 2 on lateral. Maxilliped 2 (Fig. 30), exopod 2-segmented with 4 apical setae and 3 on the lateral margin; endopod 4-segmented, terminal segment with 3 apical and 2 lateral setae, subterminal segment with 3 setae; protopod naked. Maxilliped 3 (Fig. 31), exopod 2-segmented, without setae; endopod absent.

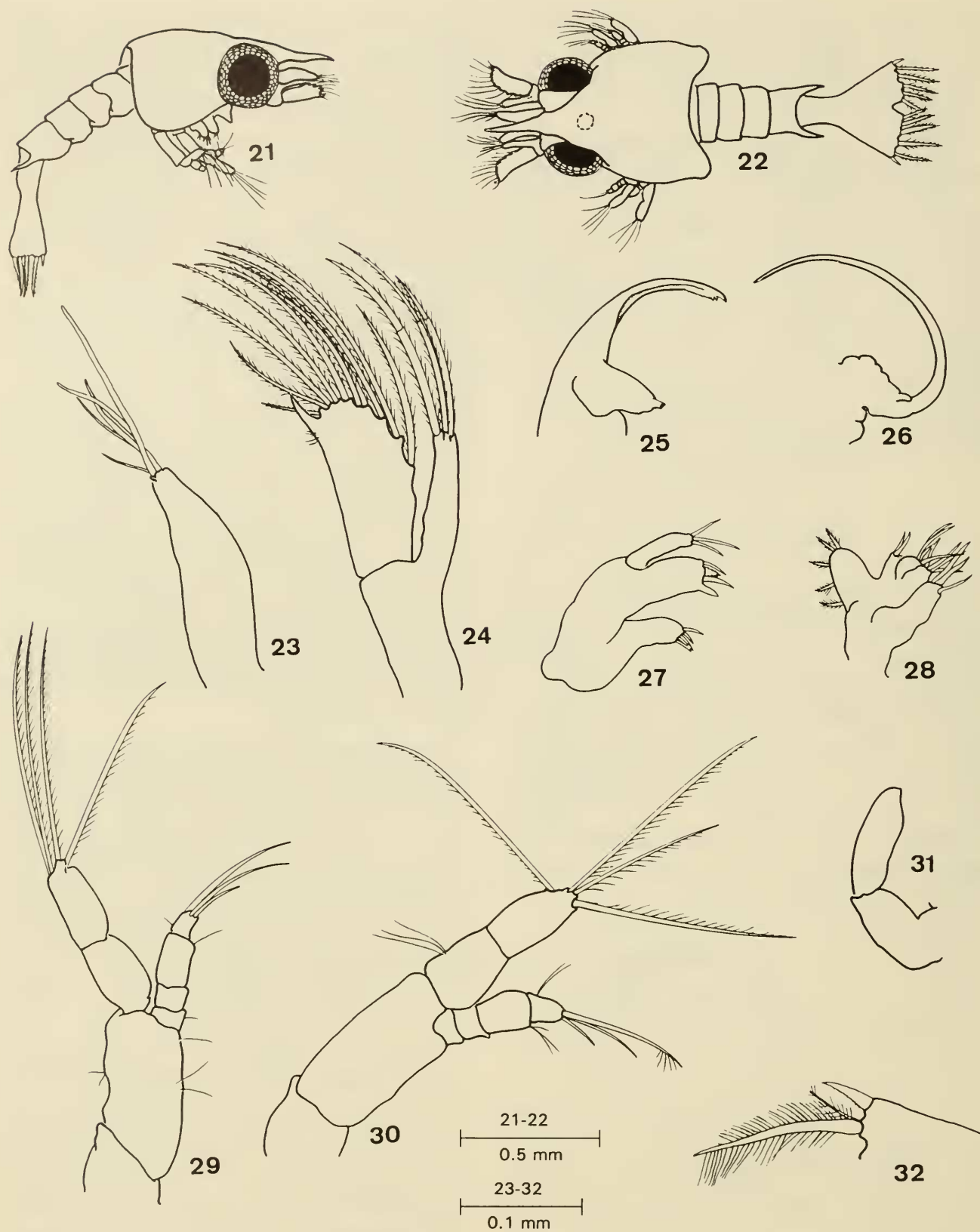
Pereopods lacking.

Telson (Fig. 22) spatuliform, with median sinus and 7+7 spines, spine 2 (Fig. 32) reduced to a hair.

Remarks. — Ngoc-Ho (1981) described the larval stages of a species belonging to the family Laomediidae from the Gulf of Mexico tentatively attributed to the genus *Axianassa*. The similarity of this larva with the one of *Axianassa australis* here described is striking, and there is no doubt that it belongs to the genus *Axianassa*. However, the species is not the same as there are differences in the proportion and number of setae in several appendices.

The laomediid larva described by Gurney (1938) as D.I., was collected off the northeastern coast of Brazil (10°20'S; 34°54'W) not very far from the northern known distribution of *A. australis*. The first stage of D.I. differs from the larva of *A. australis* in having one small spine on the basis of the antenna and a rudimentary pereopod 1. The generic identification of this larva remains unknown (Ngoc-Ho 1981).

The genus *Axianassa* has been placed in a separate family (Axianassidae) or included in the family Laomediidae, and its taxonomic position is still in debate. A complete review of the subject was recently presented by Kensley & Heard (1990), and Konishi (1989) compared the main zoeal characters among the five thalassinidean families. The identification of the larva of *A. australis*, with unquestionable laomediid characters such as the asymmetrical and sickle-shaped mandibles, the segmented endopods of maxillule and maxilla, and the absence of



Figs. 21-32. *Axianassa australis*, new species, first larval stage: 21, whole body in lateral view; 22, whole body in dorsal view, dotted circle marks the position of the chromatophore; 23, antenna 1; 24, antenna 2; 25, left mandible; 26, right mandible; 27, maxilla 1; 28, maxilla 2; 29, maxilliped 1; 30, maxilliped 2; 31, maxilliped 3; 32, telson spines 1-3.

endopods on maxilliped 3, provides additional evidence for placement of the genus *Axianassa* in the family Laomediidae.

Acknowledgments

We are grateful to Dr. Sérgio L. S. Bueno for the loan of the specimens from Bahia. The Smithsonian Office of Fellowships and Grants provided the support for a visit by one of us (S.A.R.) to Washington, and this support is gratefully acknowledged. Our sincere thanks are due to Dr. Brian Kensley, Smithsonian Institution, for his kind assistance in placing the specimens of the known species at our disposal, helpful suggestions and reading of a first draft of the manuscript. The text also benefited from readings of Dr. Janet W. Reid and Roger Griffis.

Literature Cited

- Boone, L. 1931. Anomuran, macruran crustacea from the Bay of Panama and the freshwaters of the Canal zone.—*Bulletin of the American Museum of Natural History* 61:137–189.
- Gurney, R. 1938. Larvae of decapod Crustacea. Part 5. Nephropsidea and Thalassinidea.—*Discovery Reports* 17:291–344.
- Hailstone, T. S., & W. Stephenson. 1961. The biology of *Callianassa (Trypaea) australiensis* Dana, 1852 (Crustacea, Thalassinidea).—*Papers from the Department of Zoology, University of Queensland* 1(12):259–285.
- Kensley, B., & R. Heard. 1990. The genus *Axianassa* (Crustacea: Decapoda: Thalassinidea) in the Americas.—*Proceedings of the Biological Society of Washington* 103:558–572.
- Konishi, K. 1989. Larval development of the mud shrimp *Upogebia (Upogebia) major* (De Haan) (Crustacea: Thalassinidea: Upogebiidae) under laboratory conditions, with comments on larval characters of Thalassinid families.—*Bulletin of the National Research Institute of Aquaculture* 15:1–17.
- Ngog-Ho, N. 1981. A taxonomic study of the larvae of four thalassinid species (Decapoda, Thalassinidea) from the Gulf of Mexico.—*Bulletin British Museum of Natural History (Zoology)* 40(5):237–273.
- Poore, G. C. B., & D. J. C. Griffin. 1979. The Thalassinidea (Crustacea, Decapoda) of Australia.—*Records of the Australian Museum* 32(4/6):127–321.
- Rodrigues, S. de A. 1966. Estudos sobre *Callianassa*: sistemática, biologia e anatomia. São Paulo, Universidade de São Paulo. Tese (Doutoramento), Departamento de Zoologia, Instituto de Biociências da Universidade de São Paulo, 168 pp.
- . 1971. Mud shrimps of the genus *Callianassa* Leach from the Brazilian coast (Crustacea, Decapoda).—*Arquivos de Zoologia* 20(3):191–223.
- . 1983. Aspectos da biologia de Thalassinidea do Atlântico tropical americano.—São Paulo, Universidade de São Paulo, Tese (Livre Docência), Departamento de Zoologia, Instituto de Biociências da Universidade de São Paulo, 144 pp.
- , & W. Hödl. 1990. Burrowing behaviour of *Callichirus major* and *C. mirim*.—*Wissenschaftlichen Filmen* 41:48–58.
- , & R. M. Shimizu. 1987. Ocorrência do gênero *Axianassa* Schmitt, 1924 no litoral brasileiro (Crustacea, Decapoda, Thalassinidea).—*Resumos: XIV Congresso Brasileiro de Zoologia*. Juiz de Fora, Sociedade Brasileira de Zoologia, p. 36.
- Saint Laurent, M. de. 1973. Sur la systématique et la phylogénie des Thalassinidae: définition des familles des Callianassidae et des Upogebiidae et diagnose de cinq genres nouveaux (Crustacea, Decapoda).—*Comptes Rendus de l'Académie des Sciences* 277:513–516.
- . 1979. Vers une nouvelle classification et la phylogénie des Thalassinides: définition de la superfamille Axioidea, de la sousfamille des Thalassiniinae et de deux genres nouveaux (Crustacea, Decapoda).—*Comptes Rendus de l'Académie des Sciences* 288:1395–1397.
- Schmitt, W. L. 1924. The macruran, anomuran and stomatopod Crustacea. *Bijdragen Tot de Kennis Der Fauns Von Curaçao*. Resultaten sener reis von Dr. C. J. Van der Horst in 1920.—*Bijdragen tot de Dierkunde* 23:9–82.
- . 1936. Zoologische Ergebnisse einer Reise nach Bonaire, Curaçao und Aruba im Jahre 1930. No. 16. Macruran and Anomuran Crustacea from Bonaire, Curaçao und Aruba.—*Zoologische Jahrbücher (Systematik)* 67(5/6):363–378.

Departamento de Ecologia Geral, Instituto de Biociências, Universidade de São Paulo, C. Postal 11461, 05499 São Paulo, Brazil.